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DETERMINING COSTS OF SERVICING WHOLESALE INSTITUTIONAL GROCERY ORDERS

Marketing Research Report No. 752

Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

PREFACE

One hundred million meals a day amounting to $21 billion a year are eaten away from home by Americans. Institutional sales represent 26 percent of domestic food consumption. Serving the 500,000 food service establishments are the wholesale institutional food distributors, who are becoming more conscious of the need to apply scientific management principles to their distribution operations. This research was undertaken to assist institutional wholesalers in pinpointing costs and making policy decisions based on these costs. Pinpointing costs and applying research to reduce them will contribute toward maintaining the relatively low ratio of food expenditures to consumer income in the United States.

The following research reports have been published by the U.S. Department of Agriculture in the institutional wholesale grocery field and are available for review in State agricultural experiment station libraries: "Policies and Practices of Some Leading Institutional Wholesale Grocers," MRR No. 335; "Services of Institutional Wholesale Grocers," MRR No. 571; and "Guides for Improving Institutional Wholesale Grocery Warehousing," MB No. 31.

This study was jointly financed by the U.S. Department of Agriculture and the Pillsbury Co. of Minneapolis, Minn., under cooperative agreement.

Credit is due the three institutional wholesale grocers who made their facilities, operations, and operating data available to the researchers. Their wholehearted cooperation contributed materially to the study.

The study was conducted under the general direction of R. W. Hoecker, chief, and John C. Bouma, marketing specialist, of the Wholesaling and Retailing Research Branch, Agricultural Research Service. Special credit is due John M. Foschia, Jr., formerly associated with the U.S. Department of Agriculture, who was responsible for major parts of this study.

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DETERMINING COSTS OF SERVICING WHOLESALE INSTITUTIONAL GROCERY ORDERS

By James J. Karitas, *marketing specialist, Transportation and Facilities Research Division, Agricultural Research Service*

SUMMARY

Servicing small grocery orders is expensive and sometimes unprofitable for the institutional food wholesaler. This study was made to develop a method of determining costs of servicing various sizes of orders, so that the servicing cost can be related to the selling price of the order.

In considering all the factors that make up servicing costs, order selection and delivery were two costs that vary with the size of the order. Other costs—general and administrative, sales, turnover, building, and warehouse (excluding order selection cost)—were constant or not affected by order size. Actual costs of servicing orders, by order size, were determined in three firms that represented small, medium, and large volume wholesalers (referred to as A, B, and C, respectively).

Forms were designed for use in these firms so that the labor requirements and costs for order selection and delivery, by size of order, could be determined. Delivery cost was also based on distance and the cost of owning and operating, or leasing, delivery trucks. The constant costs were obtained from operating statements of the three firms.

From this information, schedules were developed showing, in 5-case increments, the total cost of servicing orders, for orders of less than 5 cases to orders larger than 50 cases. These data show that, although costs varied in the three firms because of differences in wage rates, efficiency, building, and other costs, servicing cost in all three firms was highest for small orders, decreasing rapidly as the size of the order increased, up to orders of 30 cases and less rapidly up to orders of 50 cases. Servicing cost per case was about the same for 50-case orders as for orders larger than 50 cases.

Break-even costs, or the point at which gross profit on a given order is equal to costs, were determined from the servicing cost schedules. In firm A, orders smaller than 7 cases were unprofitable at 16 to 20 miles from the warehouse. At the same delivery distance, orders of less than 13 cases were unprofitable in firm B and orders of less than 37 cases in firm C. Firm C had high constant and variable costs and a low gross profit percentage.

The costs of delivery constitute a major part of total servicing costs for small orders. An average of delivery costs for the three firms for orders of less than five cases was 13 percent of the selling price at a delivery distance of 30 miles. As order size increased, delivery cost was of lesser importance. Orders of 55 to 59 cases at the same delivery distance averaged 1.7 percent of selling price in the three firms.

Sales costs were charged to each case equally since the firms studied paid salesmen on a straight commission basis. If salary were paid, costs for small orders would be higher than when charging sales costs equally to each case sold. Costs for large orders would be slightly lower. An analysis of salesmen's activities in one firm revealed that actual selling costs ranged from 10.1 percent of selling price for less than 5-case orders to 1.6 percent for orders of 30 to 34 cases.

A method of pricing by order size, that may encourage customers to increase the size of their orders, is illustrated. In this pricing system some constant costs are charged against the value of the case (the cost of the case to the wholesaler); other constant costs are charged equally to each case, and the variable costs are based on order size and delivery distance. Discounts possible through such a pricing system, using firm B and an order size of 6 cases as a basis for comparison, averaged 1.4 percent of selling price for an order of 12 cases and 3.5 percent for an order of 48 cases, for delivery 16 to 20 miles from the warehouse. Cost to the wholesaler for the cases ranged from $2 to $12 in the illustration presented. Greater discounts are possible on cases of lower value because in such a schedule the high-value cases carry greater overhead charges.

Pricing by order size is advantageous to the wholesaler because selling prices reflect actual distribution costs. Lower selling prices, resulting from larger orders and reduced distribution costs, should induce food service operators to concentrate their orders with one wholesaler. In addition, savings in procurement time would result.

BACKGROUND OF THE STUDY

In 1962 a survey was made of the views of 350 food service operators on services of institutional wholesalers.[1]

One of the conclusions of this study was that if institutional wholesalers adopted some type of pricing based on the size of individual orders placed with them by food service operators, rather than on total dollar volume, food service operators might be encouraged to concentrate their purchases rather than spread them among an average of 18 wholesalers as found in the survey.

Price considerations given by some wholesalers to high-volume accounts are often based on opinion rather than actual costs. Some wholesalers grant quantity discounts to high-volume customers based on dollar volume over a period of time and the average cost of servicing all accounts. But if many small orders are placed, the result may be a loss for the wholesaler because servicing small orders is expensive, especially when long delivery trips are made.

Some type of pricing that reflects differences in the wholesaler's costs appears desirable in institutional wholesale distribution because, in many instances, it would mean that one profitable order would be obtained rather than several small, unprofitable ones. For the food service operator, concentration of purchases with one wholesaler could result in reduced procurement time and less paperwork, and also lower costs for merchandise because the efficiencies resulting from handling larger orders can be reflected in the prices charged. Of course, the wholesaler should merit this concentration by providing the necessary selection of merchandise for his customers, supplying the right selection of services for them, and doing this at costs which allow his customers to be competitive.

Pricing based on order size has met with considerable success with wholesalers supplying retail stores. One institutional wholesaler who adopted a pricing system based on order size achieved a 10-percent increase in average size of orders. However, some wholesalers adopting this policy have experienced difficulty in establishing prices that realistically reflect costs.

This study was made to develop effective methods that institutional wholesalers can use to determine the costs of servicing various sizes of grocery orders and to examine order size-cost relationships that may affect their pricing policies.

To pinpoint costs of servicing orders of different sizes, studies were undertaken in three firms having annual volumes of \$1½, \$3, and \$8 million, to represent small, medium, and large institutional wholesalers. These firms were located in different parts of the United States. Operations were analyzed, suggestions made to increase efficiency in warehouse activities, and the major variable and constant costs of servicing orders of various sizes determined. The isolation of these costs and their application to specific accounts has resulted in reevaluation of pricing policies by these firms. The adoption of similar costing techniques may assist other institutional wholesalers in understanding cost relationships and in developing effective pricing policies.

The data presented in this report show the actual costs of servicing orders of various sizes in the three firms studied. Similar cost relationships probably exist in other firms. Costs depend to a large degree on local wage rates, the characteristics of the trading territory, building and land costs, the degree of efficiency achieved, and other similar factors.

The delivery costs discussed in this report represent only those for distances up to 35 miles from the warehouse. Accounts served at greater distances should be evaluated on an individual basis, depending on considerations such as the possibility of backhaul traffic on specific trips or the establishment of a new territory, as well as cost.

This report describes the techniques used to develop detailed costs of servicing various sizes of orders, shows the servicing costs in the three firms, and illustrates a possible pricing system based on order size. Some conclusions on general pricing policies are also presented.

CHARACTERISTICS OF FIRMS STUDIED

The three institutional wholesale grocery firms participating in this study sold dry groceries and some paper goods items. One warehoused a limited number of frozen food items, and one supplied frozen items and fresh produce which was obtained daily from other wholesalers.

Each firm supplied typical food service operators such as restaurants, cafeterias, in-plant feeders, hospitals, schools, clubs, rest homes, and camps. Selling practices ranged from sales by salesmen to bid selling and contract accounts. Some customers mailed in preprinted order forms and some orders were called in by salesmen.

Each firm operated a modern one-story warehouse and had a full-time warehouse foreman or superintendent. Productivity of warehouse operations varied among the three firms.

The small and medium size firms (A and B, respectively) had one-shift operations and handled both incoming and outgoing merchandise during the daytime. The large firm (firm C) received merchandise during the day shift but assembled orders and loaded trucks at night.

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[1] WISCHKAEMPER, PAUL, and BOUMA, J. C. SERVICES OF INSTITUTIONAL WHOLESALE GROCERS—OPINIONS OF FOOD-SERVICE OPERATORS. U.S. Dept. Agr. Market. Res. Rpt. No. 571, 75 pp. 1962.

Firms A and B owned their delivery equipment. Firm C owned about half of the trucks used for delivery and leased half. Normal territory covered was about 100 miles from the warehouse. Firms B and C sometimes made delivery trips of several hundred miles. Backhauls were often made on these long trips.

Methods of processing orders differed. Firm A used the billing machine and dictaphone method, whereby orders were typed on a billing machine from tapes of incoming telephone orders. Firm B used handwritten orders and a photo copier to duplicate copies; during the course of the study this firm converted to automatic data processing, using the punch card, tub-file system. Firm C used the automatic data processing—punch card system. In this firm, the selling price was marked with a special pencil on a high proportion of the cards because the salesmen often departed from the established selling price due to price competition from other wholesalers. This practice seriously affected the efficiency of the automatic data processing (tab) department.

COST TREATMENT

The assignment of costs to orders requires three basic steps. Costs must first be defined, then determined, and finally prorated on an order size basis.

Constant costs per case, in this report, are defined as those costs not affected by order size. They are charged equally to every case handled. Variable costs are defined as those affected by order size; they are charged to each case on the basis of order size.

The five major categories of constant costs were warehouse, general and administrative, sales, turnover, and building. The two major variable costs were the costs of selecting cases for orders and the costs of delivering orders.

CONSTANT COSTS

In general, the constant costs were determined from operating statements in the three companies. An exception was the cost of processing orders through the office (a general and administrative expense). This cost was determined through time studies.

Warehouse expenses included: Salaries and wages of warehouse workers, except for the portion of warehouse labor spent for order selection; warehouse and packing room supplies; repairs to warehouse equipment; depreciation to warehouse equipment; fire, accident, and theft insurance; and miscellaneous expenses.

Warehouse labor includes such activities as receiving, slot replenishment, warehouse supervision, and clean-up. Costs for checking orders and loading trucks were also considered as warehouse labor expenses and applied as constant costs per case. This appeared to be the most practical method of prorating the costs of order checking and truck loading. Although order size does affect the productivity of checking and loading, and detailed time study techniques may be used to measure it, the effect is negligible on unit costs for various sizes of orders. Order checking and truck loading productivity in the three firms each averaged 0.20 minute per case or 300 cases per man-hour.

The following items were included in general and administrative expenses: Executive and office salaries, including salaries for order processing personnel, insurance, car expense, telephone and telegraph, postage, stationery, printing and office supplies, dues and subscriptions, charity and donations, credit and collection, depreciation of office equipment, office equipment rental and repairs, data processing equipment, legal and auditing, executive travel, franchise taxes, Social Security, group insurance, pensions, and miscellaneous.

Sales costs included sales commissions, salesmen's car expenses, sales promotion, sales manager's salary, bad debts, and other minor items.

Whether sales cost should be considered as a constant or variable cost depends on the method of salesman compensation. If a salesman is paid a straight commission and pays his own expenses, then sales cost would be considered as a constant cost per case. On the other hand, if a salesman is paid salary plus expenses, sales cost per case will vary with the size of the order. If salary is paid, the company bears the burden of high selling costs for small orders. If a straight commission is paid, the salesman bears the burden. If salary and commission are paid, the salary could be considered as a variable and the commission as a constant cost per case. In this report, sales costs are treated as constant because these firms paid their salesmen straight commissions. The sales cost per case was 24.1 cents in firm A, 35.4 cents in firm B, and 26.6 cents in firm C. A comparison of sales cost as a constant and variable cost is given on pages 12 to 14.

Selling costs in the three firms were obtained by taking the total selling expense from the operating statement and dividing by the number of cases sold for the period. When computing sales costs on a constant basis, total sales cost should be divided by the number of cases sold by salesman and should not include accounts such as house or contract accounts not serviced by salesman.

Turnover expenses included taxes, insurance, and interest on the merchandise inventory.

Building expenses included taxes on real estate, repairs to buildings, depreciation or rent on buildings, heat, light, power, water, and maintenance wages.

Constant costs, including selling costs, amounted to 63.1 cents per case in firm A, 93.0 cents per case in firm B, and 90.5 cents in firm C. The low constant costs in firm A were due in part to the prevailing wage rate and a high level of efficiency in office procedures and warehouse activities.

VARIABLE COSTS

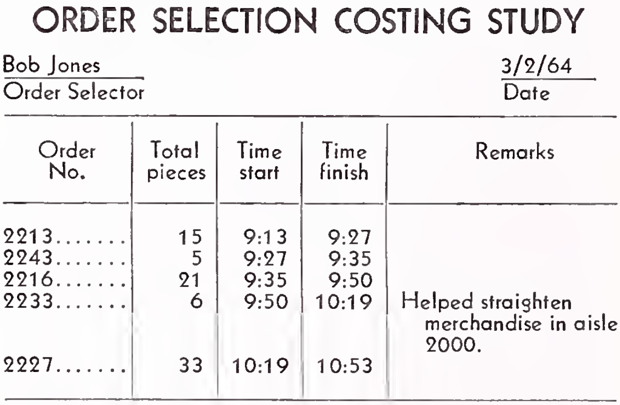
To aid in analyzing the variable costs of servicing orders—the costs for order selection and delivery—forms were designed for use in the three firms. Operating data on order selection and delivery operations were recorded in each firm for about 2 months; the data covered several thousand orders in each firm.

Order Selection

Firms A and B used four-wheel selector trucks (handtrucks) to select orders. In firm A, workers placed cases directly on the selector truck, while in firm B, workers placed cases on either of two pallets on the selector truck. In firm C workers placed cases on a pallet which was manually pulled through the warehouse with a pallet jack. Typed invoices were used in firm A, handwritten invoices in firm B, and printed invoices with items sorted for warehouse location in firm C.

The form used to obtain data on order selection productivity is shown in figure 1. The data recorded on the forms were tabulated by order size categories, and labor requirements to select various sizes of orders were determined.

The labor requirements differed among the three firms because of differences in layout, work methods, and management effectiveness, but they followed similar patterns. The labor requirements per case decreased significantly from orders of less than 5 cases to orders of 50 to 54 cases (table 1), then decreased at a less rapid rate. For labor requirements on orders larger than 50 to 54 cases in firms B and C, see appendix table 14. About 10 percent of the items selected in the three firms came from broken cases.



ORDER SELECTION COSTING STUDY

Bob Jones
Order Selector

3/2/64
Date

Order No.	Total pieces	Time start	Time finish	Remarks
2213.......	15	9:13	9:27	
2243.......	5	9:27	9:35	
2216.......	21	9:35	9:50	
2233.......	6	9:50	10:19	Helped straighten merchandise in aisle 2000.
2227.......	33	10:19	10:53	

Figure 1.—A sample form used to measure order selection productivity.

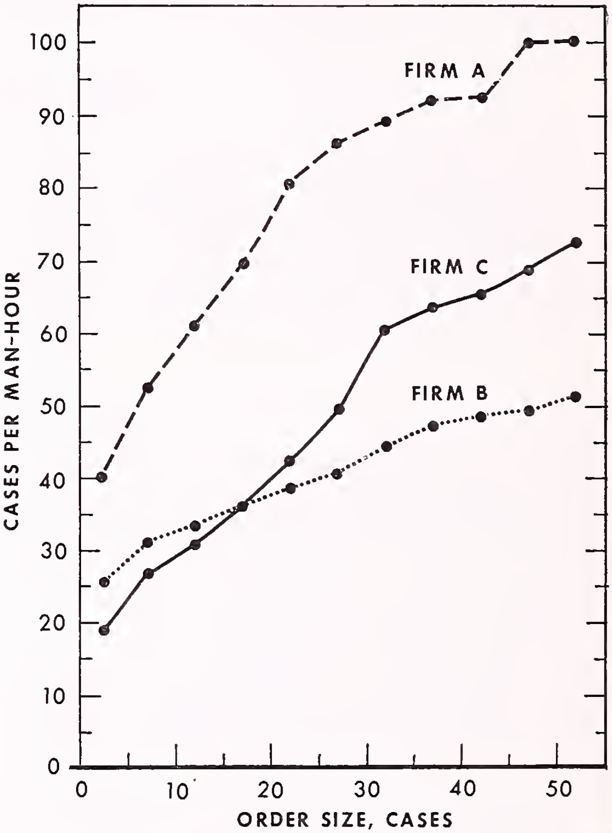


Figure 2.—Order selection productivity in three firms.

Order selection in firm C was less efficiently done than in either A or B for orders up to 15 cases. Orders larger than 15 cases were assembled at a slower pace in firm B than in the other two firms. Figure 2 illustrates production per man-hour in selecting cases in the three firms.

The cost of order selection in the three firms is given in table 1. Increasing order size in the first three order size groups can have a significant effect on order selection costs. For instance, an average of costs in the three firms would show that if a 3-case order is increased to a 7-case order, order selection costs are reduced by 20 percent. A 12-

TABLE 1.—*Labor requirements and cost per case for order selection in three institutional grocery warehouses, by order size*

Order size [1]		Labor requirements			Cost [2]		
Average (cases)	Range (cases)	Firm A	Firm B	Firm C	Firm A	Firm B	Firm C
		Man-min.	*Man-min.*	*Man-min.*	*Cents*	*Cents*	*Cents*
2½	Less than 5	1. 50	2. 34	3. 25	4. 38	10. 25	14. 89
7	5 to 9	1. 15	1. 94	2. 24	3. 36	8. 50	10. 26
12	10 to 14	. 98	1. 78	1. 94	2. 86	7. 80	8. 89
17	15 to 19	. 86	1. 66	1. 65	2. 51	7. 27	7. 56
22	20 to 24	. 74	1. 54	1. 41	2. 16	6. 75	6. 46
27	25 to 29	. 70	1. 48	1. 20	2. 04	6. 48	5. 49
32	30 to 34	. 67	1. 36	. 99	1. 96	5. 96	4. 53
37	35 to 39	. 65	1. 28	. 95	1. 90	5. 61	4. 35
42	40 to 44	. 64	1. 23	. 91	1. 87	5. 39	4. 17
47	45 to 49	. 60	1. 21	. 87	1. 75	5. 30	3. 98
52	50 to 54	. 60	1. 17	. 83	1. 75	5. 12	3. 80

[1] The ranges used throughout this report represent the average order sizes listed.

[2] At a wage rate of $1.75 per hour in firm A, $2.63 in firm B, and $2.75 in firm C.

case order can reduce order selection costs an additional 13 percent; it is 33 percent less costly than a 3-case order. Increases in order size larger than the 10 to 14 order size group will also lower order selection costs but not as dramatically as increases in the first three groups.

An interesting use of the order selection data was made in one firm. The management of this firm was experiencing difficulty in evaluating order selection productivity since labor requirements differed between shifts because of varying order size. If the shift's orders were small, more labor was required than if the orders were larger, even though the total number of cases selected was equal.

This problem was solved by requiring the truck dispatcher to post incoming orders to size categories by a simple tally method. When all orders were posted, labor requirements were predetermined by multiplying the time per order size by the number of orders as illustrated in table 2.

TABLE 2.—*A method of determining order selection labor requirements per shift in institutional wholesale grocery firms*

Order size range (cases)	Average labor required per order	Number of orders	Total labor requirements
	Man-minutes		*Man-minutes*
Less than 5	3. 9	22	85. 8
5 to 9	11. 1	17	188. 7
10 to 14	20. 0	36	720. 0
15 to 19	25. 9	50	1, 295. 0
20 to 24	30. 4	41	1, 246. 4
Total man-minutes			3, 535. 9
Total man-hours			58. 9

The use of this procedure enabled the warehouse foreman to predetermine the night shift labor requirements and provided management with a standard of performance.

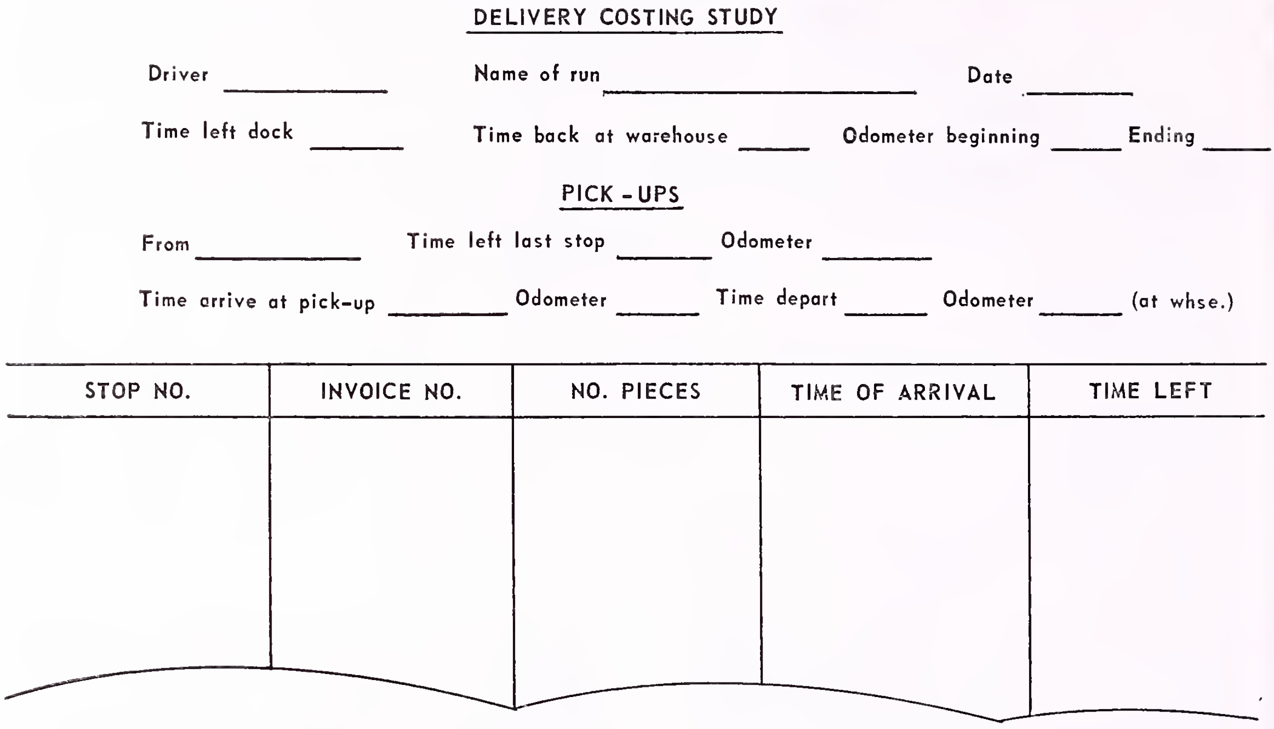
By starting employees at an earlier hour on the nights with greater man-hour requirements, the total cases were selected and trucks were loaded on time, ready for the drivers. If the trucks were not loaded when the drivers reported for work, expensive, unproductive driver-overtime resulted, since drivers were precluded from assisting the loaders by their union contract. Before this procedure was established, it was not uncommon for drivers to be idle for 2 or 3 hours waiting for trucks to be loaded. This type of labor forecasting may be used in other firms.

Delivery

The second major variable cost in the firms studied was the cost of delivering orders. A copy of the form designed to obtain data on delivery operations is shown in figure 3. Drivers recorded such information as the time they reported for work, departure time, mileage and time to the first customer, unloading time, time between stops, miscellaneous time, time from the last stop back to the warehouse, and ending mileage.

From these records the following information was obtained: Total driving time; miles driven per hour; number of cases delivered per trip; the unloading time for various sizes of orders; the number of stops per trip; the average time and distance between stops for different categories of runs; and other miscellaneous information unique to the individual firms.

Operating records were used to determine the cost per mile to operate delivery trucks. The cost per mile included charges for depreciation, gas, oil,



DELIVERY COSTING STUDY

Driver ______ Name of run ______ Date ______

Time left dock ______ Time back at warehouse ______ Odometer beginning ______ Ending ______

PICK - UPS

From ______ Time left last stop ______ Odometer ______

Time arrive at pick-up ______ Odometer ______ Time depart ______ Odometer ______ (at whse.)

STOP NO.	INVOICE NO.	NO. PIECES	TIME OF ARRIVAL	TIME LEFT

Figure 3.—Form used to record delivery information in three firms.

maintenance, tire expense, insurance, and licenses and fees. The cost per mile to operate delivery trucks was about 13 cents in firm A, about 12 cents in firm B, and 20 cents in firm C. Firms A and B owned their delivery equipment and firm C had a lease-buy arrangement.

Costs for specific order sizes were determined by adding mileage costs, driver's cost in transit, and unloading costs.

Mileage costs were computed by charging a given size order a percentage[2] of the cost per mile for the delivery truck to travel from the warehouse to the middle of a delivery zone and back to the warehouse; in addition, a constant mileage cost, representing the average distance between delivery stops, was charged to each order regardless of size. The average distance between stops was 5.1 miles in firm A; 3.5 miles in firm B; and 7.3 miles in firm C.[3]

Drivers' costs in transit were computed in the same manner, based on a percentage of the time required to travel from the warehouse to the middle of the delivery zone and back and the average time between delivery stops. Drivers' wage rates were $1.75 per hour in firm A, $3.63 in firm B, and $3.39 in firm C. Speed of the vehicles ranged from 20 to 35 miles per hour. Time between stops was 12 minutes in firm A; 8.3 minutes for city trips and 10.4 minutes for country trips in firm B; and 22 minutes in firm C.

Unloading costs were computed by multiplying the actual labor requirements for unloading a given size order by the driver's wage rate. Labor requirements per case to unload orders are given in table 3. These data represent the average time to unload various sizes of orders from trucks and to transport them into the storage facilities of the food service operator and include the time to park the truck, wait for the receipt to be signed, and close the tailgate. Typically, orders were transported by two-wheel handtrucks except where the facility precluded use of handtrucks and cases were carried by the driver. The labor requirements represent an average of many different types of receiving facilities. The sample obtained covered over two thousand deliveries in each firm.

Labor requirements to unload various sizes of orders at the delivery stop were similar for firms A and C. Firm B had higher labor requirements for orders below 30 cases than firms A and C. The only apparent reason for this difference was that firm B had more cash-on-delivery orders and drivers had to wait for payment. Although firm B had higher labor requirements than firms A and C for unloading orders of up to 29 cases, after this size it had lower labor requirements for all orders. Average productivity ranged from 2.19 minutes per case, or 27.4 cases per man-hour, for orders less than 5 cases, to 0.61 minute per case, or 98.4 cases per man-hour, for orders of 32 cases (fig. 4).

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[2] The percentage was computed by dividing the order size by the total number of cases in the average truckload. Average truckloads were 82 cases for trips up to 15 miles and 167 cases for trips over 15 miles in firm A. In firm B truckloads averaged 180 cases and in firm C, 312 cases.

[3] In firm B average distance between stops increased to 5.2 miles beyond 20 miles from the warehouse. In firm C average distance between stops increased to 11 miles beyond 50 miles from the warehouse.

Delivery costs per case were developed for the three firms for distances up to 35 miles from the warehouse, by 5-mile increments. Table 4 shows a typical delivery cost schedule developed for firm B for deliveries 11 to 15 miles from the warehouse and the basis for the computations.

The schedules developed for each firm reflect the operating characteristics and the driver and vehicle costs in each firm. Since delivery factors such as the average time and distance between stops varied between the three firms, delivery cost schedules were developed for each firm on data from each following the general procedure as shown in table 4. Summaries of these delivery schedules are presented in table 5.

In table 5 it is shown that small orders shipped any distance are several times more costly to deliver than larger orders and that as distance increases, delivery costs per case also increase.

The costs shown in table 5 reflect costs only up to 35 miles in firms A and C and up to 39 miles in firm B. Costs of trips longer than these distances would be greater. Trips of more than 35 to 39 miles should be analyzed separately to determine the cost of servicing specific accounts.

In firm A, in the 5-mile delivery zone, orders of less than 5 cases cost 48 cents per case to deliver or 8.4 percent of the average case selling price of \$5.70, and orders of 57 cases cost 4 cents per case to deliver or 0.7 percent of the average case selling price. At 35 miles from the warehouse, delivery costs per case ranged from 10.5 percent of selling price for orders of less than 5 cases to 1.9 percent for an order of 57 cases. It becomes apparent that cost of delivery could be significantly reduced if small orders (less than 10 cases) were upgraded or increased to at least 20 to 30 cases.

TABLE 3.—*Labor requirements per case to unload orders at delivery stops, three institutional grocery wholesalers, by size of order*

Order size range (cases)	Firm A	Firm B [1]	Firm C [1]	Average, firms A, B, and C
	Man-minutes	*Man-minutes*	*Man-minutes*	*Man-minutes*
Less than 5	1. 99	2. 60	1. 99	2. 19
5 to 9	1. 02	1. 68	1. 05	1. 25
10 to 14	. 83	1. 24	. 80	. 96
15 to 19	. 73	. 92	. 72	. 79
20 to 24	. 68	. 76	. 68	. 71
25 to 29	. 65	. 67	. 63	. 65
30 to 34	. 63	. 59	. 61	. 61

[1] Labor requirements for orders larger than 30 to 34 cases are given in appendix table 15.

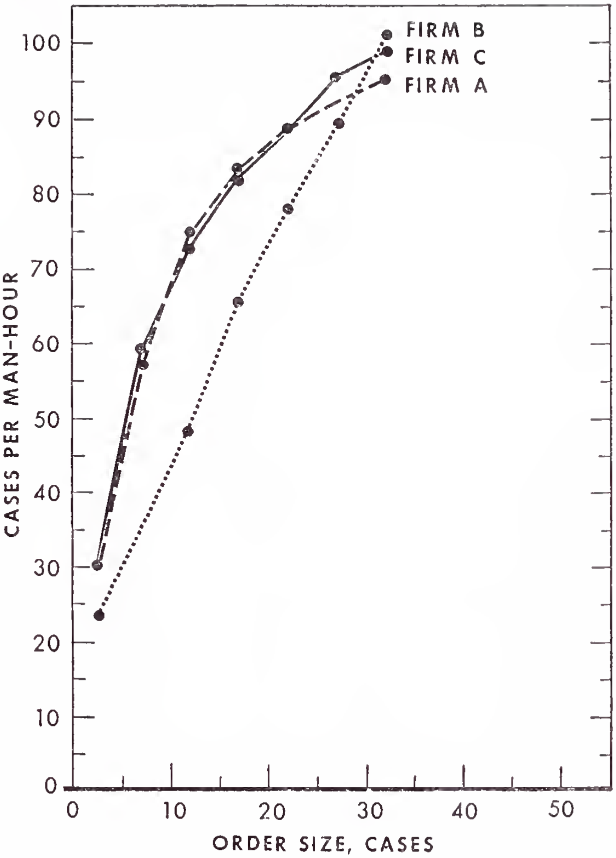

FIGURE 4.—Unloading productivity by order size for institutional grocery orders of three firms.

In firm B in the 5-mile zone, orders of less than 5 cases cost 54 cents per case to deliver, and orders of 112 cases, 3 cents, or from 8.3 percent to 0.5 percent of the average case selling price (\$6.50). At 39 miles, the cost per case ranged from 15.5 percent of selling price for orders of less than 5 cases to 1.8 percent for a 110-case order.

In firm C, which had higher mileage costs and higher wage rates than the other firms, orders of less than 5 cases cost \$1.09 per case in the 5-mile zone and orders of 67 cases, 7 cents, a range of from 16.8 to 1.1 percent of the average case selling price (\$6.50). At 35 miles, costs ranged from 18.1 percent to 2.0 percent for the two order sizes.

For smaller orders, the size of the order has more influence than the delivery distance on the cost of delivery. This is not true for medium-size orders (30 cases); increasing these orders to 50 or 60 cases would reduce delivery costs by only 2 to 4 cents a case in the three firms.

To illustrate the effect of order size and delivery distance on delivery costs, the actual costs in the three firms for several delivery distances were averaged and delivery cost as a percentage of the average case selling price (\$6.23) was computed (table 6). This figure ranged from 11.3 percent for less than 5 cases down to 0.9 percent for the 55 to 59 case group at the 5-mile delivery distance; at 20 miles, from 12.5 percent to 1.6 percent; and at 35 miles, from 14.9 percent to 2.1 percent.

This comparison clearly shows the high delivery costs for the smaller order sizes and indicates the potential savings in delivery costs that may be achieved through increasing the size of the smaller orders.

TABLE 4.—*Delivery cost per order and per case 11 to 15 miles from the warehouse, institutional wholesale grocery firm B, by order size*

Order size range (cases)	Percent of average truckload of 180 cases	Cost per order				Cost per case
		Mileage [1]	Driver's time in transit [2]	Unloading [3]	Total	
	Percent	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
Less than 5	1. 4	44. 9	55. 5	39. 3	140	56
5 to 9	3. 8	54. 4	64. 5	71. 4	190	27
10 to 14	6. 6	63. 2	75. 1	90. 1	228	19
15 to 19	9. 4	72. 0	85. 6	94. 4	252	15
20 to 24	12. 2	80. 8	96. 2	101. 0	278	13
25 to 29	15. 0	89. 6	106. 7	109. 5	306	11
30 to 34	17. 8	98. 5	117. 3	114. 3	330	10
35 to 39	20. 6	107. 3	127. 9	121. 0	356	10
40 to 44	23. 3	115. 8	138. 0	127. 0	381	9
45 to 49	26. 1	124. 6	148. 6	133. 7	407	9
50 to 54	28. 9	133. 4	159. 1	141. 6	434	8
55 to 59	31. 7	142. 3	169. 7	151. 8	464	8
60 to 64	34. 4	150. 8	179. 9	157. 9	446	7
65 to 69	37. 2	159. 6	190. 4	162. 1	512	7
70 to 74	40. 0	168. 4	201. 0	170. 0	539	7
75 to 79	42. 8	177. 2	211. 6	177. 3	566	7
80 to 84	45. 6	186. 0	222. 1	183. 3	591	7
85 to 89	48. 3	194. 5	232. 3	189. 4	616	7
90 to 94	51. 1	203. 4	242. 8	194. 8	641	7
95 to 99	53. 9	212. 4	253. 4	199. 7	666	7
100 to 104	56. 7	221. 0	264. 0	203. 9	689	7
105 to 109	59. 4	229. 5	274. 1	206. 9	710	7
110 to 114	62. 2	238. 3	284. 7	209. 9	733	6
115 to 119	65. 0	247. 2	295. 2	212. 4	755	6

[1] Distance to and from middle of delivery zone (26 miles) × cost per mile (12.1 cents) × percent of average truckload + product of cost per mile (12.1 cents) and average distance between stops (3.5 miles). Computed on unrounded percentage of average truckload.

[2] Total driving time (26 miles at 25 m.p.h. = 62.4 min.) × driver's wage rate per minute ($3.63 per hour, or 6.05 cents per minute) × percent of average truckload + product of driver's wage rate (6.05 cents) and time to drive 3.5 miles (8.3 min.). Computed on unrounded percentage of average truckload.

[3] Labor requirements to unload orders (app. table 15) × 6.05 cents per minute.

TABLE 5.—*Cost per case to deliver orders of three institutional grocery wholesalers, by delivery distance and order size*

Order size range (cases)	0 to 5 miles	6 to 10 miles	11 to 15 miles	16 to 20 miles [1]	21 to 25 miles [1]	26 to 30 miles	31 to 35 miles [2]
FIRM A							
Less than 5	$0. 48	$0. 51	$0. 53	$0. 51	$0. 52	$0. 54	$0. 60
5 to 9	. 19	. 22	. 24	. 22	. 23	. 24	. 27
10 to 14	. 12	. 15	. 17	. 15	. 17	. 18	. 19
15 to 19	. 09	. 12	. 14	. 12	. 14	. 15	. 16
20 to 24	. 08	. 11	. 13	. 11	. 12	. 14	. 14
25 to 29	. 07	. 10	. 12	. 10	. 11	. 12	. 13
30 to 34	. 06	. 09	. 11	. 09	. 11	. 12	. 13
35 to 39	. 06	. 08	. 11	. 09	. 10	. 11	. 12
40 to 44	. 05	. 08	. 11	. 08	. 10	. 11	. 11
45 to 49	. 05	. 08	. 10	. 08	. 09	. 11	. 11
50 to 54	. 05	. 08	. 10	. 08	. 09	. 10	. 11
55 to 59	. 04	. 07	. 10	. 08	. 09	. 10	. 11

See footnotes at end of table.

TABLE 5.—*Cost per case to deliver orders of three institutional grocery wholesalers, by delivery distance and order size*—Continued

Order size range (cases)	0 to 5 miles	6 to 10 miles	11 to 15 miles	16 to 20 miles [1]	21 to 25 miles [1]	26 to 30 miles	31 to 35 miles [2]
FIRM B							
Less than 5	$0.54	$0.55	$0.56	$0.70	$0.72	$0.74	$1.01
5 to 9	.24	.26	.27	.33	.34	.36	.46
10 to 14	.16	.18	.19	.23	.24	.25	.32
15 to 19	.12	.13	.15	.18	.19	.20	.25
20 to 24	.10	.11	.13	.15	.16	.18	.22
25 to 29	.08	.10	.11	.14	.15	.16	.19
30 to 34	.07	.09	.10	.12	.14	.15	.18
35 to 39	.07	.08	.10	.12	.13	.14	.17
40 to 44	.06	.08	.09	.11	.12	.14	.16
45 to 49	.06	.07	.09	.10	.12	.13	.15
50 to 54	.05	.07	.08	.10	.11	.13	.15
55 to 59	.05	.07	.08	.10	.11	.12	.14
60 to 64	.05	.06	.07	.09	.11	.12	.14
65 to 69	.04	.06	.07	.09	.10	.12	.14
70 to 74	.04	.06	.07	.09	.10	.12	.13
75 to 79	.04	.06	.07	.09	.10	.11	.13
80 to 84	.04	.06	.07	.09	.10	.11	.13
85 to 89	.04	.06	.07	.08	.10	.11	.13
90 to 94	.04	.05	.07	.08	.10	.11	.12
95 to 99	.04	.05	.07	.08	.10	.11	.12
100 to 104	.04	.05	.07	.08	.09	.11	.12
105 to 109	.04	.05	.07	.08	.09	.10	.12
110 to 114	.03	.05	.06	.08	.09	.10	.12
FIRM C							
Less than 5	1.09	1.10	1.11	1.12	1.12	1.14	1.18
5 to 9	.41	.42	.43	.44	.45	.46	.48
10 to 14	.25	.26	.27	.28	.29	.30	.32
15 to 19	.18	.20	.21	.22	.23	.24	.25
20 to 24	.15	.16	.17	.18	.19	.20	.21
25 to 29	.13	.14	.15	.16	.17	.18	.19
30 to 34	.11	.12	.13	.14	.15	.17	.17
35 to 39	.10	.11	.12	.13	.14	.15	.16
40 to 44	.09	.10	.11	.12	.13	.15	.15
45 to 49	.08	.10	.11	.12	.13	.14	.14
50 to 54	.08	.09	.10	.11	.12	.13	.14
55 to 59	.07	.09	.10	.11	.12	.13	.14
60 to 64	.07	.08	.09	.10	.11	.13	.13
65 to 69	.07	.08	.09	.10	.11	.12	.13

[1] The size of the average truckload in firm A increased from 82 to 167 cases and average distance between stops from 3.5 to 5.2 miles beyond 15 miles, resulting in lower delivery costs and lower total servicing costs for the 16 to 20 mile zone and 21 to 25 mile zone, as compared with the 11 to 15 mile zone.

[2] Delivery distance was 31 to 39 miles for firm B.

TOTAL COSTS OF SERVICING ORDERS

The per-case constant costs and the order selection and delivery costs for each order size category were added to determine total costs per case to service various order sizes. These costs are presented in table 7 for the delivery distances indicated. A large portion of the wholesalers' volume was concentrated within these distances.

Firms B and C had similar costs except for orders of less than 5 cases. Firm A had lower costs for all order sizes than either firms B or C, because of a high level of efficiency in warehouse and office procedures and lower wage rates and other costs in their trading territory as compared with firms B and C.

A meaningful comparison of dollar costs for various sizes of orders may be made by relating per-case servicing costs to the average case selling price. In firm A, the average selling price was $5.70 and in firms B and C, $6.50.

In firm A, total servicing costs in the 0 to 5 mile delivery zone ranged from 20.5 percent of selling price for less than 5 cases to 12.1 percent for the 55 to 59 case category. At 31 to 35 miles, costs for these categories ranged from 22.4 percent to 13.2 percent.

In firm B, costs in the 0 to 5 mile delivery zone ranged from 24.4 percent of selling price for less than 5 cases to 16.0 percent for the 55 to 59 case category. In the 31 to 39 mile zone, costs for these categories ranged from 31.7 percent to 17.4 percent.

In firm C, in the 0 to 5 mile zone, costs ranged from 33.5 percent to 15.7 percent for the same categories as in the previous comparison. In the 31 to 35 mile zone, costs ranged from 34.9 percent to 16.8 percent.

TABLE 6.—*Delivery cost per case, as percent of average case selling price, average of three institutional grocery wholesalers, for selected delivery distances, by order size* [1]

Order size range (cases)	5 miles	20 miles	35 miles
	Percent	*Percent*	*Percent*
Less than 5	11. 3	12. 5	14. 9
5 to 9	4. 5	5. 3	6. 5
10 to 14	2. 8	3. 5	4. 4
15 to 19	2. 1	2. 9	3. 5
20 to 24	1. 8	2. 4	3. 0
25 to 29	1. 5	2. 1	2. 7
30 to 34	1. 3	1. 9	2. 6
35 to 39	1. 2	1. 8	2. 4
40 to 44	1. 1	1. 7	2. 2
45 to 49	1. 0	1. 6	2. 1
50 to 54	1. 0	1. 6	2. 1
55 to 59	. 9	1. 6	2. 1

[1] Average case selling price was $6.23.

TABLE 7.—*Total cost per case of servicing orders (constant, order selection, and delivery costs) for three institutional grocery wholesalers, by distance from warehouse and by order size* [1]

Order size range (cases)	0 to 5 miles	6 to 10 miles	11 to 15 miles	16 to 20 miles [2]	21 to 25 miles [2]	26 to 30 miles	31 to 35 miles [3]
FIRM A							
Less than 5	$1. 17	$1. 19	$1. 22	$1. 20	$1. 21	$1. 22	$1. 28
5 to 9	. 85	. 88	. 88	. 89	. 90	. 91	. 93
10 to 14	. 78	. 81	. 81	. 81	. 83	. 84	. 85
15 to 19	. 75	78	. 78	. 79	. 79	. 81	. 82
20 to 24	. 73	. 76	. 76	. 78	. 78	. 79	. 80
25 to 29	. 72	. 75	. 75	. 76	. 76	. 78	. 79
30 to 34	. 71	. 74	. 74	. 75	. 76	. 77	. 78
35 to 39	. 71	. 74	. 74	. 74	. 75	. 76	. 77
40 to 44	. 70	. 73	. 73	. 74	. 75	. 76	. 77
45 to 49	. 70	. 72	. 72	. 73	. 74	. 75	. 76
50 to 54	. 69	. 72	. 72	. 73	. 73	. 74	. 75
55 to 59	. 69	. 71	. 71	. 72	. 73	. 74	. 75
FIRM B							
Less than 5	1. 59	1. 60	1. 61	1. 75	1. 77	1. 79	2. 06
5 to 9	1. 27	1. 29	1. 30	1. 36	1. 37	1. 38	1. 49
10 to 14	1. 18	1. 20	1. 21	1. 25	1. 26	1. 27	1. 34
15 to 19	1. 13	1. 14	1. 16	1. 19	1. 20	1. 21	1. 26
20 to 24	1. 11	1. 12	1. 14	1. 16	1. 17	1. 19	1. 23
25 to 29	1. 08	1. 10	1. 11	1. 14	1. 15	1. 16	1. 19
30 to 34	1. 07	1. 09	1. 10	1. 12	1. 14	1. 15	1. 18
35 to 39	1. 06	1. 07	1. 09	1. 11	1. 12	1. 13	1. 16
40 to 44	1. 05	1. 07	1. 08	1. 10	1. 11	1. 13	1. 15
45 to 49	1. 04	1. 06	1. 08	1. 09	1. 11	1. 12	1. 14
50 to 54	1. 04	1. 06	1. 07	1. 09	1. 10	1. 12	1. 14
55 to 59	1. 04	1. 06	1. 07	1. 09	1. 10	1. 11	1. 13
60 to 64	1. 03	1. 05	1. 06	1. 08	1. 10	1. 11	1. 13
65 to 69	1. 02	1. 05	1. 06	1. 08	1. 09	1. 11	1. 13
70 to 74	1. 02	1. 04	1. 06	1. 08	1. 08	1. 10	1. 12
75 to 79	1. 02	1. 04	1. 05	1. 07	1. 08	1. 09	1. 11
80 to 84	1. 02	1. 04	1. 05	1. 07	1. 08	1. 09	1. 11
85 to 89	1. 02	1. 04	1. 05	1. 06	1. 08	1. 09	1. 11
90 to 94	1. 02	1. 03	1. 05	1. 06	1. 08	1. 09	1. 10
95 to 99	1. 02	1. 03	1. 05	1. 06	1. 08	1. 09	1. 10
100 to 104	1. 02	1. 03	1. 05	1. 06	1. 07	1. 09	1. 10
105 to 109	1. 02	1. 03	1. 05	1. 06	1. 07	1. 08	1. 10
110 to 114	1. 02	1. 03	1. 04	1. 06	1. 07	1. 08	1. 10

See footnotes at end of table.

TABLE 7.—*Total cost per case of servicing orders (constant, order selection, and delivery costs) for three institutional grocery wholesalers, by distance from warehouse and by order size* [1]—Continued

Order size range (cases)	0 to 5 miles	6 to 10 miles	11 to 15 miles	16 to 20 miles [2]	21 to 25 miles [2]	26 to 30 miles	31 to 35 miles [3]
FIRM C							
Less than 5	$2.18	$2.19	$2.20	$2.21	$2.21	$2.23	$2.27
5 to 9	1.44	1.45	1.46	1.47	1.48	1.49	1.51
10 to 14	1.27	1.28	1.29	1.30	1.31	1.32	1.54
15 to 19	1.18	1.20	1.21	1.22	1.23	1.24	1.25
20 to 24	1.13	1.14	1.15	1.16	1.17	1.18	1.19
25 to 29	1.10	1.11	1.12	1.13	1.14	1.15	1.16
30 to 34	1.07	1.08	1.09	1.10	1.11	1.13	1.15
35 to 39	1.06	1.07	1.08	1.09	1.10	1.11	1.12
40 to 44	1.05	1.06	1.07	1.08	1.09	1.11	1.11
45 to 49	1.03	1.05	1.06	1.07	1.08	1.09	1.09
50 to 54	1.03	1.04	1.05	1.06	1.07	1.08	1.09
55 to 59	1.02	1.04	1.05	1.06	1.07	1.08	1.09
60 to 64	1.02	1.03	1.04	1.05	1.06	1.08	1.08
65 to 69	1.02	1.03	1.04	1.05	1.06	1.07	1.08

[1] Constant costs per case were 63.0 cents for firm A, 93.0 cents for firm B, and 90.5 cents for firm C. Order selection costs are in table 1 and delivery costs in table 5.

[2] Average truckload in firm A increased from 82 to 167 cases and average distance between stops from 3.5 to 5.2 miles beyond 15 miles, resulting in lower delivery costs and lower total servicing costs for the 16 to 20 mile zone and 21 to 25 mile zone, as compared with the 11 to 15 mile zone.

[3] Delivery distance was 31 to 39 miles for firm B.

BREAK-EVEN COSTS

The costs presented in this report are actual costs incurred in the three firms studied. The costs for small orders were high because of high order selection and delivery costs. On the other hand, constant costs per case for large orders were relatively high. Some wholesalers tend to overestimate the efficiency of handling large orders.

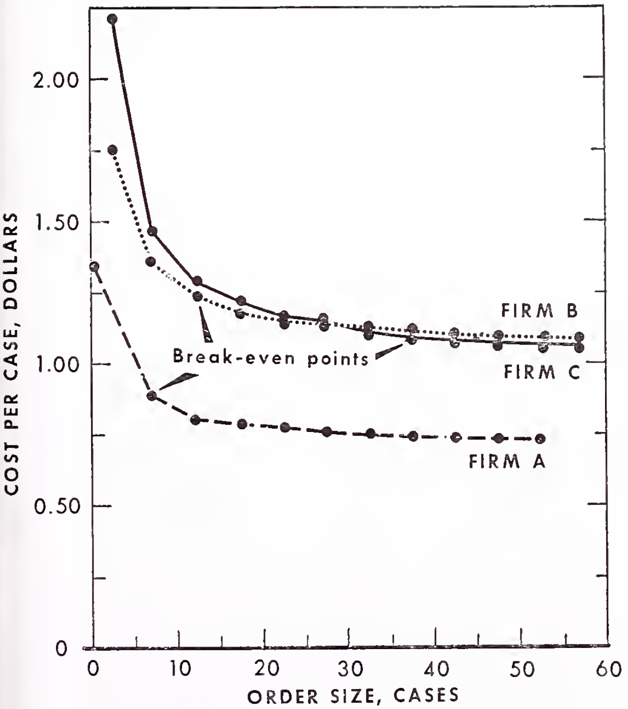

FIGURE 5.—Total servicing cost per case in firms A, B, and C for 16- to 20-mile zone.

Figure 5 shows the total servicing cost per case and break-even order size for firms A, B, and C, for deliveries 16 to 20 miles from the warehouse.

In firm A, with an average case selling price of $5.70, and a gross margin of 15.5 percent, a margin of $0.89 per case would be generated by the sale of an average case. The break-even point for deliveries 16 to 20 miles from the warehouse would be 7-case orders. Orders over seven cases would produce net profit; under seven cases, a loss would occur. At farther distances from the warehouse, order size would have to be increased in order to break even. For instance, at 30 miles from the warehouse a 7-case order would cost $0.91 per case to service (see table 7).

Firm B, with an average case value of $6.50, and a gross margin of 19 percent, or $1.24, would break even on orders of about 13 cases. Orders of less than 13 cases delivered 16 to 20 miles would, on the average, be unprofitable.

Firm C, with an average case value of $6.50, and a gross margin of 17 percent, or $1.10, would suffer a loss on orders smaller than 37 cases for deliveries 16 to 20 miles from the warehouse.

The principal reason for the higher break-even point in firm C, as compared with firm B, was higher order selection costs and higher delivery costs, due in part to high wage rates and truck leasing costs. Firm B operated its own trucking fleet at a cost of $0.12 per mile while firm C, which leased half of its delivery equipment, operated at a cost of $0.20.[4]

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[4] The author does not wish to imply that this is a typical leasing cost figure but only the cost in this one firm.

TREATING SALES COST AS A VARIABLE COST

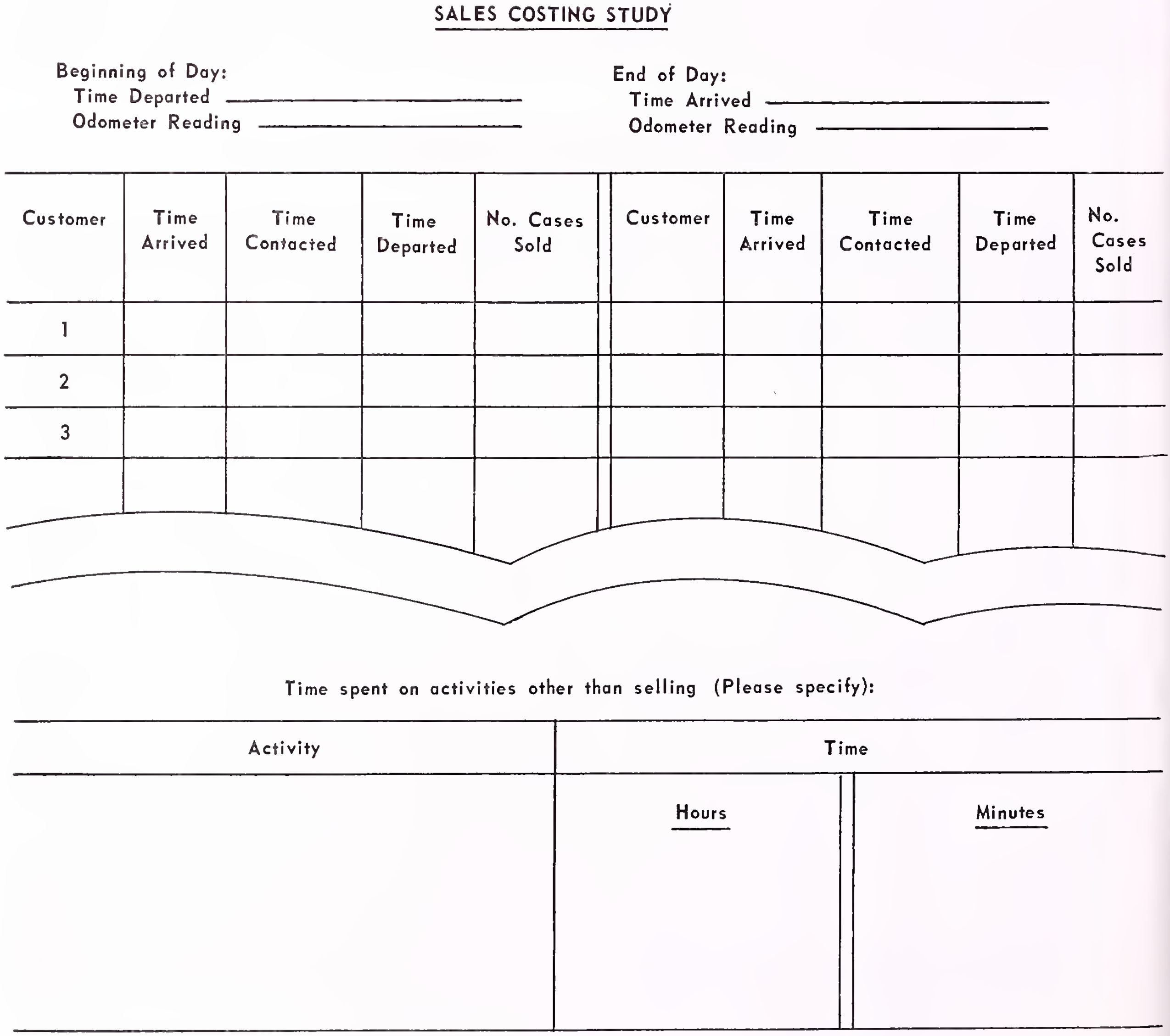
As previously pointed out, the treatment given to sales costs depends on the method of salesmen's compensation. If straight salary is paid, the sales costs become variable with the size of the order; that is, the larger the order, the lower selling costs per case. If straight commission is paid, the per-case sales costs are constant regardless of order size. The salesman bears the high costs of selling the small order. These costs may be offset by commissions earned on large orders.

Salary plus commission arrangements in effect partially subsidize salesmen for selling the smaller accounts and also for promoting new accounts. It appears that this type of arrangement, if properly supervised, would tend to gain new customers and also provide the salesmen with incentive to increase sales through new account development.

To determine the effect of treating sales as a variable cost on the total cost of servicing orders, the sales cost data in firm A were applied as both constant and variable costs.

Records were kept in firm A for one month to determine actual selling costs for various sizes of orders. The daily record kept by the individual salesmen is illustrated in figure 6.

Data obtained from these records revealed such information as actual selling time, number of unproductive calls, total number of cases sold, mileage driven, driving time, and time for other activities such as calling in orders and checking invoices.



SALES COSTING STUDY

Beginning of Day:
Time Departed ______
Odometer Reading ______

End of Day:
Time Arrived ______
Odometer Reading ______

Customer	Time Arrived	Time Contacted	Time Departed	No. Cases Sold	Customer	Time Arrived	Time Contacted	Time Departed	No. Cases Sold
1									
2									
3									

Time spent on activities other than selling (Please specify):

Activity	Time	
	Hours	Minutes

Figure 6.—A form used to collect sales cost information.

TABLE 8.—*Sales cost per order and per case as a variable cost, institutional grocery wholesale firm A, by order size*

Order size range (cases)	Per order							Cost per case
	Selling time and cost				Car expense [3]	Cost for salesman's [4] driving time	Total cost	
	Direct time	Indirect time [1]	Total time	Cost [2]				
	Min.	*Min.*	*Min.*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
Less than 5	7.2	2.5	9.7	33.0	48.0	64.3	145.3	58.1
5 to 9	11.9	7.1	19.0	64.6	48.0	64.3	176.9	25.3
10 to 14	15.6	12.1	27.7	94.2	48.0	64.3	206.5	17.2
15 to 19	20.4	17.2	37.6	127.8	48.0	64.3	240.1	14.1
20 to 24	20.0	22.2	42.2	143.5	48.0	64.3	255.8	11.6
25 to 29	24.0	27.3	51.3	174.4	48.0	64.3	286.7	10.6
30 to 34	23.4	32.3	55.7	189.4	48.0	64.3	301.7	9.4

[1] Indirect time includes time spent when no cases were sold and average waiting time.

[2] The salesman's average wage rate per minute (3.4 cents) multiplied by the total selling time.

[3] Total mileage driven (5,322) ÷ total productive calls (1,105) × car expense per mile (10 cents) = 48 cents.

[4] Total driving time (20,895 minutes) ÷ total productive calls (1,105) × salesman's wage rate per minute (3.4 cents) = 64.3 cents.

Sales cost per case was computed as the cost for total selling time, car expense, and the salesman's driving time (table 8). The total selling time per order size was determined from the salesman's records and multiplied by his average wage rate per minute to arrive at the actual selling cost for each order size group.[5] The salesman's car expense and the cost for his driving time were then added to the selling costs. Car expense was allocated equally to each order size group. This expense was determined by dividing the total mileage driven by all salesmen by the total number of productive sales calls to arrive at the average number of miles per call. This figure was then multiplied by $0.10, which represents the cost per mile of operating an automobile and covers gas, oil, depreciation, etc. The cost for the salesman's driving time was also allocated equally to each order size group by computing the total driving time and dividing by the number of orders.

Selling costs in firm A ranged from 9.4 cents per case for a 30 to 34 case order to 58.1 cents per case for an order of less than 5 cases. In other words, selling costs per case for less than 5 cases were six times as much as for 30 to 34 cases.

Table 9 shows variable sales costs expressed as a percentage of the average case selling price. Selling cost per case ranged from 1.6 percent of selling price for a 30 to 34 case order to 10.1 percent for an order of less than 5 cases.

One conclusion that can be drawn from these data from firm A is that if sales costs were reduced through the use of preprinted order forms, telephone orders, or other methods not requiring a sales call, then a significant discount could be granted to small accounts willing to forego personalized selling and other services provided by salesmen. Some accounts may be willing to do this, others may not.

Table 10 shows the difference between treating sales costs as constant and as variable in total costs of servicing orders.

TABLE 9.—*Sales cost per case as variable cost, as a percentage of selling price, institutional grocery wholesale firm A, by order size*

Order size range [1] (cases)	Sales cost per case	Percentage of average case selling price ($5.74)
		Percent
Less than 5	$0.581	10.1
5 to 9	.253	4.4
10 to 14	.172	3.0
15 to 19	.141	2.5
20 to 24	.116	2.0
25 to 29	.106	1.8
30 to 34	.094	1.6

[1] Order sizes larger than 30 to 34 cases are not included because the sample of orders over this range was limited.

Total costs of servicing orders are understated for orders up to 10 cases when sales costs are treated as constant because the salesman's costs exceeded the 4 percent commission earned. This is particularly evident for orders of less than 5 cases, when total costs are 22 percent lower than indicated by the variable or straight salary method. The point of indifference is almost reached in the 5 to 9 case range where total servicing costs are understated by only 1.1 percent and sales costs, whether treated as constant or variable, have about the same effect on total servicing costs.

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[5] Average commissions earned were divided by the number of hours worked to determine the wage rate.

TABLE 10.—*Difference between total servicing costs per case, when sales cost is treated as constant, and as variable, for deliveries 16 to 20 miles from the warehouse, institutional grocery wholesale firm A, by order size*

Order size range (cases)	Total servicing cost		Difference	Percentage difference[1]
	Sales cost variable (straight salary)	Sales cost constant (straight commission)		
				Percent
Less than 5	$1.56	$1.22	−$0.34	−21.8
5 to 9	.92	.91	−.01	−1.1
10 to 14	.76	.83	+.07	+9.2
15 to 19	.70	.80	+.10	+12.5
20 to 24	.66	.78	+.12	+18.2
25 to 29	.64	.77	+.13	+20.3
30 to 34	.62	.77	+.15	+24.2

[1] Using variable cost as base.

Table 10 also indicates that sales cost on a constant or commission basis tends to overstate total servicing costs for orders larger than 10 cases. This is particularly evident in the 30 to 34 case range where treating sales as a constant cost overstates servicing costs by 24.2 percent.

Figure 7 graphically illustrates the effect of sales treated as constant and variable costs on total costs of servicing orders.

Data in figure 7 indicate that total servicing costs in firm A decrease sharply as the average size of the order increases to 14 cases, regardless of the treatment given to sales cost. However, when sales costs are treated as a variable expense, total servicing costs decrease more rapidly than when sales costs are considered a constant expense. Total servicing costs tend to level off at the 27-case order size when sales costs are regarded as being constant.

Treating sales as a variable cost had little effect on shifting the break-even point. The break-even point in firm A was 89 cents per case when sales cost was treated as constant. The cost curves shown in figure 7 intersect at 90 cents.

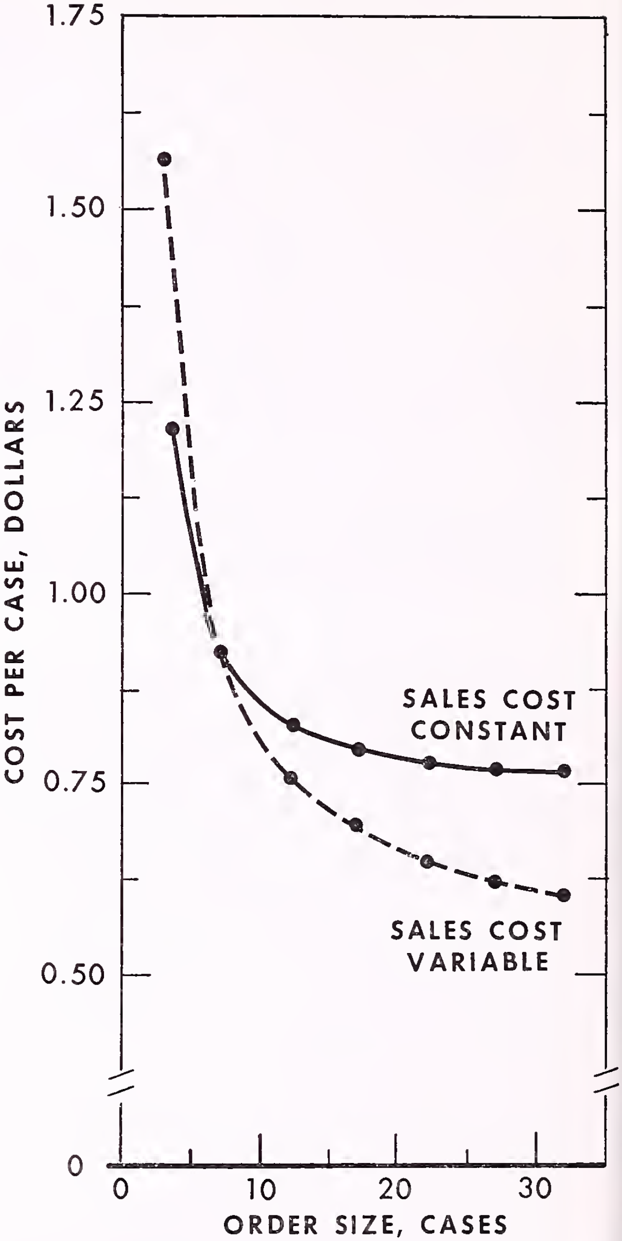

FIGURE 7.—Total servicing costs per case in firm A with sales costs treated as both fixed and variable for 11 to 15 mile zone.

PRICING BY ORDER SIZE

The costs and cost comparisons presented thus far in this report were developed for the average case, with an average markup or gross margin. However, any given order may consist of individual cases with selling prices and gross margins that vary from the average. This section of the report describes how firms may use costing data to develop pricing schedules based on order size that also reflect the value (cost to the wholesaler) of individual cases.

To develop such a schedule, costs may be isolated as described in the sections on cost treatment, constant costs, and variable costs. However, a finer breakdown of the constant costs should be made. The cost for office order processing should be separated from the general and administrative cost, and the costs for order checking and truck loading should be separated from warehouse cost. The costs for order processing, order checking and truck loading, together with the sales cost, should be charged equally to all cases since the same work is performed for each case regardless of its value.

The remaining constant costs—warehouse, general and administrative, building, and turnover—should be charged against the value of the individual case.

The first step is to determine the constant costs, in the breakdown just described, for a case of average value. Using firm B as an example, the average case value was $5.27 (average selling price was $6.50 and average gross margin was 19 percent). The constant costs per case were:

	Cents
Sales	35. 4
Order checking	. 9
Truck loading	. 7
Office order processing	2. 8
All other constant costs	53. 1
Total	92. 9

Sales, order checking, truck loading and office order processing costs should be charged equally to all cases, regardless of value. These costs amount to 39.8 cents (the flat charge).

The constant costs that should be charged against the value of the case amount to 53.1 cents, or 10.1 percent of the average case value of $5.27. This percentage should be used to compute those costs chargeable against the value of the case (the value charge) for all the different case values. A case valued at $12, for example, would be charged $1.21 (10.1 percent of $12), and a case valued at $3 would be charged 30 cents.

Using a case valued at $6.00 in firm B as an example in developing a selling price, we would have:

The cost of the case to the wholesaler (case value)	$6. 000
The constant costs charged to each case (flat charge)	. 398
The constant costs based on case value (value charge)	. 606
Total	7. 004

The net profit based on case value is next computed and added to this total. Using 2.5 percent of the case value, $0.15 is added:

Total of case value and constant costs	$7. 004
Net profit	. 150
Total	7. 154

The third step is to add the cost of order selection based on the size of the order. In our example, if the order is for less than 5 cases, the order selection cost per case would be $0.102:

Total of case value, constant costs, and net profit	$7. 154
Order selection cost for less than 5 cases	. 102
Total	7. 256

If the order is for 35 to 39 cases, the order selection cost per case would be $0.06:

Total of case value, constant costs, and net profit	$7. 154
Order selection cost for 35 to 39 cases	. 060
Total	7. 214

The final step in determining the selling price of the case is to add the cost of delivery, based on the size of the order and the delivery distance. In our example, if the order is for less than 5 cases, and the delivery distance is 16 to 20 miles from the warehouse, the delivery cost would be $.700, and the selling price per case would be $7.96.

Total of case value, constant costs, net profit, and order selection cost for less than 5 cases	$7. 256
Delivery cost for less than 5 cases, 16 to 20 miles	. 700
Total—selling price per case	7. 956

If the order is for 35 to 39 cases, and the delivery distance is 31 to 39 miles from the warehouse, the delivery cost would be $.170, and the selling price per case would be $7.38.

Total of case value, constant costs, net profits, and order selection cost for 35 to 39 cases	$7. 214
Delivery cost for 35 to 39 cases, 31 to 35 miles	. 170
Total—selling price per case	7. 384

Examples of development of a pricing schedule, shown in two steps, are given in tables 11 and 12. In table 11, the price of the case before delivery is established; this is referred to here as the base selling price. The base selling price covers all costs up to delivery: The cost of the case to the wholesaler, the constant costs (the flat charge and the value charge), the net profit, and the order selection cost based on the size of the order.

Table 12 shows the selling prices of cases based on value, order size, and delivery distance.

In table 11, the base selling prices per case for each case value show a difference of only 5 or 6 cents per case from the smallest to largest order size. Six cents amounts to about 1 percent of average case value in firm B. In other words, discounts on large (50-case) orders, based on order selection costs alone, would not be significant enough to encourage customers to increase order size. However, delivery costs applied on a variable basis do produce a wide range in selling prices, from the smallest to largest order (table 12). For example, delivery costs for this firm at 21 to 25 miles from the warehouse ranged from 72 cents per case for less than 5 cases to 12 cents for the 45 to 49 case category, a difference of 60 cents, or 9.2 percent of the selling price for the average case.

If sales costs, the largest component of the flat charge in constant costs, were charged on a variable basis, a greater difference between selling prices for various sizes of orders would result. If salesmen in a firm are on straight salary, rather than commission, sales cost should be applied as a variable, and a greater customer incentive to in-

TABLE 11.—*Schedule of base selling prices per case, institutional grocery wholesale firm B, by case value and order size (cases)* [1]

Case value (cost to the wholesaler)	Less than 5	5 to 9	10 to 14	15 to 19 and 20 to 24	25 to 29 and 30 to 34	35 to 39 40 to 44 and 45 to 49
$1. 00	$1. 64	$1. 62	$1. 61	$1. 60	$1. 59	$1. 58
2. 00	2. 77	2. 75	2. 74	2. 73	2. 72	2. 71
3. 00	3. 90	3. 88	3. 87	3. 86	3. 85	3. 84
4. 00	5. 02	5. 00	4. 99	4. 98	4. 97	4. 96
5. 00	6. 15	6. 13	6. 12	6. 11	6. 10	6. 09
6. 00	7. 27	7. 25	7. 24	7. 23	7. 22	7. 21
7. 00	8. 40	8. 38	8. 37	8. 36	8. 35	8. 34
8. 00	9. 53	9. 51	9. 50	9. 49	9. 48	9. 47
9. 00	10. 65	10. 63	10. 62	10. 61	10. 60	10. 59
10. 00	11. 78	11. 76	11. 75	11. 74	11. 73	11. 72
12. 00	14. 03	14. 01	14. 00	13. 99	13. 98	13. 97
14. 00	16. 28	16. 26	16. 25	16. 24	16. 23	16. 22
16. 00	18. 53	18. 51	18. 50	18. 49	18. 48	18. 47
18. 00	20. 77	20. 75	20. 75	20. 74	20. 73	20. 72
20. 00	23. 02	23. 00	23. 00	22. 99	22. 98	22. 97

[1] Base selling price is computed as the value of the case plus constant cost (flat charge per case at $0.398 and value charge at 10.1 percent), net profit at 2.5 percent of case value, and order selection cost by order size, as shown in table 1. Delivery cost is added to the base selling price to arrive at the selling price; see table 12.

crease order size would result because a larger discount could be offered on the larger size orders.

To obtain a measure of the incentive offered customers to purchase larger orders through this type of pricing schedule, a comparison of selling prices for orders of 6, 12, and 48 cases is presented in table 13.

An order of 6 cases composed of items ranging in value from $2 to $12 shows an average selling price of $7.77 per case. The same cases would have an average selling price of $7.66 when sold in an order of 12 cases, an incentive saving of 1.4 percent. The same items sold in a 48-case order would have an average selling price of $7.50, an

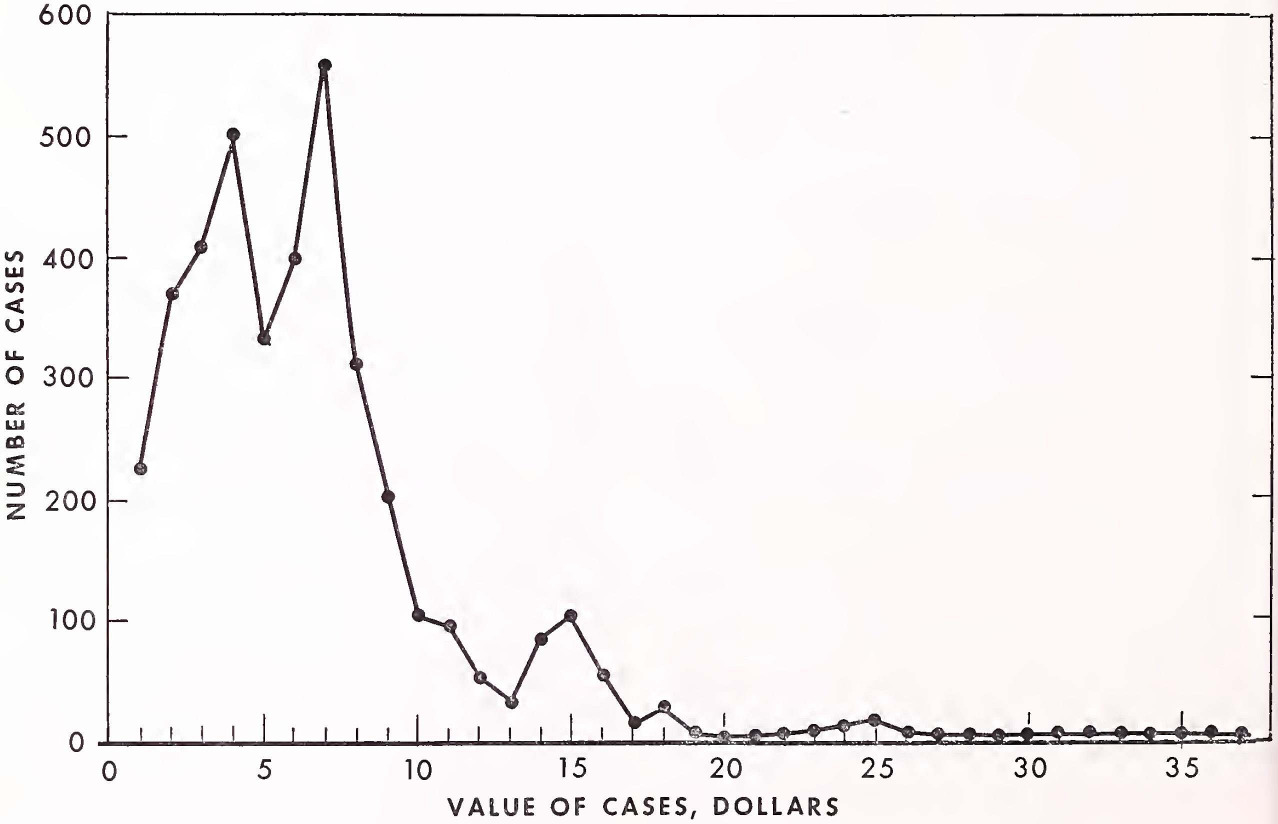

FIGURE 8.—Sales distribution by case value in firm A.

TABLE 12.—*Partial schedule of selling prices per case, institutional grocery wholesale firm B, by case value, order size, and delivery distance*

Case value and order size (cases)	Base selling price	Up to 5 miles		11 to 15 miles		21 to 25 miles		31 to 39 miles	
		Delivery cost	Selling price	Delivery cost	Selling price	Delivery cost	Selling price	Delivery cost	Selling price
$2.00									
Less than 5	$2.77	$0.54	$3.31	$0.56	$3.33	$0.72	$3.49	$1.01	$3.78
5 to 9	2.75	.24	2.99	.27	3.02	.34	3.09	.46	3.21
10 to 14	2.74	.16	2.90	.19	2.93	.24	2.98	.32	3.06
15 to 19	2.73	.12	2.85	.15	2.88	.19	2.92	.25	2.98
20 to 24	2.73	.10	2.83	.13	2.86	.16	2.89	.22	2.95
45 to 49	2.71	.06	2.77	.09	2.80	.12	2.83	.15	2.86
$4.00									
Less than 5	5.02	.54	5.56	.56	5.58	.72	5.74	1.01	6.03
5 to 9	5.00	.24	5.24	.27	5.27	.34	5.34	.46	5.46
10 to 14	4.99	.16	5.15	.19	5.18	.24	5.23	.32	5.31
15 to 19	4.98	.12	5.10	.15	5.13	.19	5.17	.25	5.23
20 to 24	4.98	.10	5.08	.13	5.11	.16	5.14	.22	5.20
45 to 49	4.96	06	5.02	.09	5.05	.12	5.08	.15	5.11
$6.00									
Less than 5	7.27	.54	7.81	.56	7.83	.72	7.99	1.01	8.28
5 to 9	7.25	.24	7.49	.27	7.52	.34	7.59	.46	7.71
10 to 14	7.24	.16	7.40	.19	7.43	.24	7.48	.32	7.56
15 to 19	7.23	.12	7.35	.15	7.38	.19	7.42	.25	7.48
20 to 24	7.23	.10	7.33	.13	7.36	.16	7.39	.22	7.45
45 to 49	7.21	.06	7.27	.09	7.30	.12	7.33	.15	7.36
$8.00									
Less than 5	9.53	.54	10.07	.56	10.09	.72	10.25	1.01	10.54
5 to 9	9.51	.24	9.75	.27	9.78	.34	9.85	.46	9.97
10 to 14	9.50	.16	9.66	.19	9.69	.24	9.74	.32	9.82
15 to 19	9.49	.12	9.61	.15	9.64	.19	9.68	.25	9.74
20 to 24	9.49	.10	9.59	.13	9.62	.16	9.65	.22	9.71
45 to 49	9.47	.06	9.53	.09	9.56	.12	9.59	.15	9.62
$10.00									
Less than 5	11.78	.54	12.32	.56	12.34	.72	12.50	1.01	12.79
5 to 9	11.76	.24	12.00	.27	12.03	.34	12.10	.46	12.22
10 to 14	11.75	.16	11.91	.19	11.94	.24	11.99	.32	12.07
15 to 19	11.74	.12	11.86	.15	11.89	.19	11.93	.25	11.99
20 to 24	11.74	.10	11.84	.13	11.87	.16	11.90	.22	11.96
45 to 49	11.72	.06	11.78	.09	11.81	.12	11.84	.15	11.87
$20.00									
Less than 5	23.02	.54	23.56	.56	23.58	.72	23.74	1.01	24.04
5 to 9	23.00	.24	23.24	.27	23.27	.34	23.34	.46	23.46
10 to 14	23.00	.16	23.16	.19	23.19	.24	23.24	.32	23.32
15 to 19	22.99	.12	23.11	.15	23.14	.19	23.18	.25	23.24
20 to 24	22.99	.10	23.09	.13	23.12	.16	23.15	.22	23.21
45 to 49	22.97	.06	23.03	.09	23.06	.12	23.09	.15	23.12

incentive saving to the food service operator of 3.5 percent.

The incentive to increase the size of orders with such a price schedule would probably be greater than the illustration shown, because orders frequently are composed of many cases of low dollar value, and the cases of lower dollar value have the greater discount.

To illustrate the composition of a typical wholesaler's orders, an analysis of one wholesaler's invoices covering several thousand cases was made. The selling price of the average case in this firm was $5.96. A distribution of case selling prices, however, showed that 56 percent of the cases sold had selling prices lower than $5.96. Eighty percent had selling prices lower than $8.00. About 10 percent of the cases had selling prices higher than $12.00 (fig. 8).

TABLE 13.—*Comparison of selling price per case, institutional grocery wholesale firm B, for three sizes of orders delivered 16 to 20 miles from the warehouse*

Case value (cost of case to the wholesaler)	6-case order		12-case order		Difference in selling price between a 6 & 12 case order		48-case order		Difference in selling price between a 6 & 48 case order	
	Selling price	Gross [1] margin	Selling price	Gross [1] margin			Selling price	Gross [1] margin		
		Percent		*Percent*		*Percent*		*Percent*		*Percent*
$2.00	$3. 08	35. 1	$2. 97	32. 7	$0. 11	−3. 6	$2. 81	28. 8	$0. 27	−8. 8
$4.00	5. 33	25. 0	5. 22	23. 4	. 11	−2. 1	5. 06	20. 9	. 27	−5. 1
$5.00	6. 46	22. 6	6. 35	21. 3	. 11	−1. 7	6. 19	19. 2	. 27	−4. 2
$6.00	7. 58	20. 8	7. 47	19. 8	. 11	−1. 4	7. 31	17. 9	. 27	−3. 5
$8.00	9. 84	18. 7	9. 73	17. 8	. 11	−1. 1	9. 57	16. 4	. 27	−2. 7
$12.00	14. 34	16. 3	14. 23	15. 7	. 11	−. 8	14. 07	14. 7	. 27	−1. 9
Average	7. 77	20. 6	7. 66	19. 6	. 11	−1. 4	7. 50	17. 8	. 27	−3. 5

[1] Gross margin is the difference between the item at wholesaler's cost and the selling price, divided by the selling price and expressed as a percentage.

DISCUSSION

Thus far, costs of three institutional wholesalers have been examined and the relationship between costs and order size established. From costs in one firm, a cost-plus type of pricing system based on order size has been presented. There are other types of cost-plus pricing systems which also reflect order size but are based on the weight of the order rather than the number of cases. Any system that reflects actual operating costs appears desirable. Adoption of such pricing systems could produce more stable institutional wholesale pricing than presently exists in most areas of the United States. Pricing based on costs may also allow food service operators to concentrate buying activity on procuring merchandise that meets definite quality specifications rather than emphasizing price alone.

A substantial part of the costs of servicing orders is overhead costs. Some components of overhead costs can be reduced on a per-case, or unit, basis by increasing business volume. For instance, rent is a constant cost that would not increase with added volume, unless of course the warehouse is operating at capacity and additional volume would require an addition to the warehouse. One approach to increasing business volume would be to reduce costs by increasing efficiency. The resultant savings could be allocated to sales promotion to increase business, or to price reductions in highly competitive markets.

To establish a better pricing system based on reduced costs, the institutional wholesaler should consider implementing any or all of the following actions:

1. Increase the average size of orders. Order size may be increased by developing an incentive or cost-plus type of pricing; discouraging small orders by adding realistic additional charges for small orders; paying salesmen little or no commission on small orders; and by broadening lines carried.
2. Increase efficiency of specific activities. Warehousing and delivery operations, selling, office, and inventory control procedures are the most promising areas for improvement.
3. Curtail salesmen's services and increase salesmen's productivity. The use of preprinted order forms and substituting telephone calls for personal calls will help achieve lower sales costs.

From this study, seven conclusions can be drawn about the pricing policies of institutional wholesalers.

1. The reduction of selling prices on individual items may achieve short run advantages for an individual firm, but unless price reductions are related to distribution costs, they may also generate competition based on price alone which could result in unprofitable operations and business failures.
2. Since orders larger than 50 cases have about the same servicing costs as orders of 50 cases, any discount granted on orders over 50 cases should be regarded as a sales promotion device rather than one justified on the basis of lower servicing cost.
3. Any discounts granted should be based on individual order size rather than dollar volume over a period of time.
4. Accounts foregoing personalized selling through the use of preprinted order forms, telephone orders, or other devices tend to reduce the wholesaler's costs and may be granted appropriate discounts to encourage the practices.
5. The establishment of minimum order sizes by institutional wholesalers can be justified from a cost standpoint.
6. The use of separate delivery cost schedules appears very desirable. Some wholesalers in highly competitive areas absorb delivery costs in

order to compete with wholesalers located closer to the customer. However, delivery costs often make the difference between profit and loss, particularly on the small orders.

7. Increasing volume through "contract selling," a practice whereby an institutional distributor agrees to supply chain type food service operators at a fixed markup, should be carefully evaluated prior to such agreements.

Some institutional wholesalers feel that since present fixed, or overhead, costs are being charged against present volume, any additional volume that returns more than the variable costs of servicing the accounts and makes some contribution to overhead will produce a profit. However, if a large part of a wholesaler's volume is sold on this basis, any increased costs such as higher wage rates, decline in warehouse productivity, increase in transportation costs or other costs have a serious impact on profits since this added business may be contributing little to overhead costs.

When a wholesaler suddenly finds himself with a net operating loss he is faced with the choice of dropping the accounts not carrying their full share of overhead costs and becoming more unprofitable, or revising the selling prices upward and possibly losing accounts to another wholesaler who may also be using the same type of pricing logic.

This is not to say that contract accounts are undesirable. On the contrary, contracts negotiated with large food service operators can add to profit, but all costs should be considered. For instance, should contract accounts be subsidized by other accounts in regard to overhead costs? What size orders are involved? If sales costs are eliminated on these accounts, are there other costs involved such as executive selling, costs of special movement reports to the customer, costs of procuring and maintaining special inventories? Another important consideration is the territory involved. Are long delivery distances involved? Perhaps a separate delivery charge should be added for distant deliveries, or goods be shipped by common carrier with the customer paying delivery charges. Many food service operators are well aware of the problems and costs associated with wholesale distribution and are not eager to negotiate unfair contracts that are unprofitable for the wholesaler since food service operators realize that efficient wholesaler service is a basic requirement and also that any contract should be to the mutual benefit of both parties.

APPENDIX

TABLE 14.—*Labor requirements per case and per order for order selection in three institutional grocery warehouses, by order size*

Order size range (cases)	Per case [1]	Per order	Cases per man-hour
FIRM A	*Man-minutes*	*Man-minutes*	
Less than 5	1.50	3.7	40
5 to 9	1.15	8.0	52
10 to 14	.98	11.7	61
15 to 19	.86	14.6	70
20 to 24	.74	16.3	81
25 to 29	.70	18.9	86
30 to 34	.67	21.4	90
35 to 39	.65	24.0	92
40 to 44	.64	26.9	94
45 to 49	.60	28.2	100
50 to 54	.60	31.2	100
FIRM B			
Less than 5	2.34	5.8	26
5 to 9	1.94	13.6	31
10 to 14	1.78	21.4	34
15 to 19	1.66	28.2	36
20 to 24	1.54	33.9	39
25 to 29	1.48	40.0	41
30 to 34	1.36	43.5	44
35 to 39	1.28	47.4	47
40 to 44	1.23	51.7	49
45 to 49	1.21	56.9	50
50 to 54	1.17	60.8	51
55 to 59	1.16	66.1	52
60 to 64	1.15	71.3	52
65 to 69	1.13	75.7	53
70 to 74	1.09	78.5	55
75 to 79	1.07	82.4	56
80 to 84	1.05	86.1	57
85 to 89	1.04	90.5	58
90 to 94	1.02	93.8	59
95 to 99	1.01	98.0	59
100 to 104	.99	101.0	61
105 to 109	.97	103.8	62
FIRM C			
Less than 5	3.25	8.1	19
5 to 9	2.24	15.7	27
10 to 14	1.94	23.3	31
15 to 19	1.65	28.0	36
20 to 24	1.41	31.0	43
25 to 29	1.20	32.4	50
30 to 34	.99	31.7	61
35 to 39	.95	35.1	63
40 to 44	.91	38.2	66
45 to 49	.87	40.9	69
50 to 54	.83	43.2	72
55 to 59	.80	45.6	75
60 to 64	.77	47.7	78
65 to 69	.74	49.6	81
70 to 74	.71	51.1	85
75 to 79	.68	52.4	88
80 to 84	.67	54.9	90
85 to 89	.64	55.7	94
90 to 94	.63	58.0	95
95 to 99	.61	59.2	98
100 to 125	.59	66.7	102
126 to 150	.58	80.0	103
151 to 175	.58	94.5	103
176 to 200	.57	107.2	105
201 to 225	.56	119.3	107
226 to 250	.56	133.3	107
251 to 275	.55	144.6	109
276 to 300	.53	152.6	113
301 to 325	.53	165.9	113
326 to 350	.52	175.8	115
351 to 375	.52	194.0	115

[1] Weighted for 8 percent repack room items.

TABLE 15.—*Labor requirements per case and per order for unloading at delivery stops, by order size, three institutional grocery wholesalers*

Order size range (cases)	Per case	Per order	Cases per man-hour
FIRM A	*Man-minutes*	*Man-minutes*	
Less than 5	1.99	5.0	30
5 to 9	1.02	7.1	59
10 to 14	.83	10.0	72
15 to 19	.73	14.2	82
20 to 24	.68	15.0	88
25 to 29	.65	17.6	92
30 to 34 [1]	.63	20.2	95
FIRM B			
Less than 5	2.60	6.5	23
5 to 9	1.68	11.8	36
10 to 14	1.24	14.9	48
15 to 19	.92	15.6	65
20 to 24	.76	16.7	79
25 to 29	.67	18.1	90
30 to 34	.59	18.9	102
35 to 39	.54	20.0	111
40 to 44	.50	21.0	120
45 to 49	.47	22.1	128
50 to 54	.45	23.4	133
55 to 59	.44	25.1	136
60 to 64	.42	26.1	143
65 to 69	.40	26.8	150
70 to 74	.39	28.1	154
75 to 79	.38	29.3	158
80 to 84	.37	30.3	162
85 to 89	.36	31.3	167
90 to 94	.35	32.2	171
95 to 99	.34	33.0	176
100 to 104	.33	33.7	182
105 to 109	.32	34.2	188
110 to 114	.31	34.7	194
115 to 119	.30	35.1	200
120 to 124	.29	35.4	207
125 to 129	.28	35.6	214
130 to 134	.27	35.6	222
135 to 139	.27	37.0	222
140 to 144	.26	36.9	231
145 to 149	.25	36.7	240
150 to 154	.24	36.5	250
155 to 159	.24	37.7	250
160 to 164	.23	37.3	261
165 to 169	.22	38.4	273
170 to 174	.22	37.8	273
175 to 179	.22	38.9	273
180 to 184	.22	40.0	273
185 to 189	.22	41.1	273
190 to 194	.22	42.2	273
195 to 199	.22	43.3	273
FIRM C			
Less than 5	1.99	5.0	30
5 to 9	1.05	7.4	57
10 to 14	.80	9.6	75
15 to 19	.72	12.2	83
20 to 24	.68	15.0	88
25 to 29	.63	17.0	95
30 to 34	.61	19.5	98
35 to 39	.58	21.5	103
40 to 44	.57	23.9	105
45 to 49	.56	26.3	107
50 to 54	.55	28.6	109
55 to 59	.55	31.4	109
60 to 64	.55	34.1	109
65 to 69	.55	36.9	109

[1] Firm A delivered few orders larger than 30 to 34 cases.